PATENT

UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Hryn, et. al.

Application: ELECTRODIALYSIS OPERATION WITH BUFFER SOLUTION

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CERTIFICATE OF MAILING

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Marilynn Oleck	Marilynn Oleck	November 2, 2007
Name of Representative	Signature of Representative	Date of Signature

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37 C.F.R. 1.132 Affidavit of Inventor
John N. Hryn

I, John N. Hryn, declare that I am an inventor in the above-identified matter and I further state the following:

1. I received my B.A.Sc., my M.A.Sc., and my Ph.D. in Metallurgy and Materials Science from the University of Toronto.

2. Since 2006, I have been a Senior Development Associate at Praxair, Inc.

3. Prior to my employ at Praxair, I was a Metallurgical Engineer at Argonne National Laboratory since 1993, and since 1993, a focus of my research emphasis has been on electrodialysis and related technologies.

4. Prior to my employ at Argonne Laboratory, I was a post-doctoral fellow at the Massachusetts Institute of Technology.

5. I have published approximately 20 papers in the area of materials processing, including 5 papers on electrodialysis processing. Representative publications in electrodialysis include:

Krumdick, G., D. Graziano, and J.N. Hryn, "Electrodialysis Technology for Salt Recovery from Aluminum Salt Cake Process," Fourth International Symposium on Recycling of Metals and Engineered Materials, The Minerals, Metals, & Materials Society, Warrendale, Penn, (2000).pp. 1159-70.

Hryn, J.N., G. Krumdick, D. Graziano, and K. Sreenivasarao, "Electrodialysis Technology for Salt Recovery from Aluminum Salt Cake," Proceedings of the 1999 Seventeenth Annual Membrane Technology Conference, Business Communications Co., Inc., Norwalk, Conn., (2000). Invited.

6. I have received a patent (registration number 6,461,491) for research related to electrodialysis processing.

7. I have read the July 2, 2007 Official Action. It is my understanding that my invention is being rejected due to earlier U.S. Patent No. 6,621,225 to Mani and U.S. Patent No. 3,595,766, to Scheder. Neither teaches control of pH levels in the electrodialysis cell.

8. Scheder uses buffers to maintain pH levels solely in the electrode rinse solution streams. Mani and Scheder combined do nothing more than suggest that changes to pH levels in the main chambers of the cells are acceptable, as long as, per Mani, the pH of the cells remains under 14, and per Scheder, the electrode rinse solution stream pH is controlled. My invention rejects this approach and instead seeks to eliminate changes in the production streams by introducing a buffer thereto.

9. The invention shown in Scheder involves a different type of electrodialysis. Concentration Electrodialysis used by Scheder involves three solutions - the feed or diluate, concentrate (brine), and an electrode rinse solution stream. The purpose of Concentration Electrodialysis is to remove minerals from the diluate feed stream and transfer them to the concentrate stream thereby creating a refined diluate product. In Concentration Electrodialysis it is well understood that acid will be generated in the electrode rinse solution in contact with the anode and alkai will be generated at the cathode. These reactions are unwanted side reactions. To control these reactions, Scheder discusses control of pH of the electrode rinse solution stream. As such, Scheder is concerned only with controlling the pH of the electrode rinse solution stream, and focuses on the anode chamber and its electrolyte.

10. Scheder cannot be adapted to add the buffer to the production (whey) stream inasmuch as the purpose of Scheder is to purify the whey by removing minerals therefrom. The addition of any buffer to the whey, as the present invention teaches, would irrevocably contaminate the product stream.

11. A critical element of Scheder is the use of neutral membranes in place of anionic membranes. The use of neutral membranes prevents precipitation. Scheder also discloses that precipitation contributes to the failure of the system which occurs when the throughput of the system is increased. Mani, however, requires use of anionic membranes in the stack.

12. My invention, however, includes both cationic and anionic membranes, and the present invention relies on this arrangement.

13. In order to control impurities, Mani requires the use of a nanofilter. Mani uses filtration techniques to remove cations in order to prevent precipitation of calcium and magnesium hydroxides. Precipitates such as these must be controlled in order to prevent damage to the membranes found within the electrodialysis cell.

14. Mani suggests the introduction of neutralizing agents into the base loop of the cell in order to reach target range, which again, is too wide to achieve the benefits of the present invention. Further, Mani controls pH to create additional value-added products, such as sodium carbonate, or sodium sulfite. However, these value-added products are created only after the electrodialysis process has started. The purpose of the addition of neutralizing agents is creation of these value-added products rather than controlling the electrodialysis process within the cells.

15. My invention does not use neutralizing agents in order to create such additional products. Instead, my invention uses buffering agents to maintain the cell within a desired pH, as claimed. The formation of the value-added products through neutralization is not possible in the present invention inasmuch as neutralization requires a significant shift in pH. In lieu of using neutralization to create dramatic shifts in system pH, the present invention relies on buffers within the system to minimize any pH changes. As such, the discussion of neutralization by the Mani system is not relevant to the present invention whose goal of increased productivity is only reached because the present invention prevents the very shifts in pH that Mani requires to create the value-added products.

16. In my invention, the buffering agents are added directly to the production streams, contrary to the processes of Scheder and Mani. The addition of buffering agents to the product streams prevents changes in pH and increases the efficacy of my invention, whereas the addition of buffering agents to Scheder's product will foul the product.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Sincerely,

Nov 1, 2007
Date

John N. Hryn, co-inventor